2018

NATIONAL RICE R&D HIGHLIGHTS

PHILRICE AGUSAN

STATION

PHILRICE

Table of Contents

PHILRICE AGUSAN

Branch director: Gerardo F. Estoy Jr.

EXECUTIVE SUMMARY

PhilRice Agusan develops, verifies, and promotes location-specific technologies and provides high-quality seeds in partnership with rice stakeholders. The station envisions productive and profitable rice industry in Northeastern Mindanao.

In 2018, PhilRice Agusan identified 130 inbred rice lines and 17 hybrid varieties that outperformed the check variety. There were 286 lines also observed to tolerate abiotic or biotic stresses.

To control white stem borer, pest management researchers found that the best time to apply Metarhizium sp. is every 14 days from transplanting to panicle initiation. PhilRice Agusan also developed egg incubators that are cheaper than available in the market.

The station verified integrated crop management technologies in farmers' fields. Growing of NSIC Rc 222 fertilized with 98-28-28 kg N-P_2O_5-K_2O/ha in three splits resulted in yields higher than the average in Caraga: 5.6t/ha in dry season and 6.3t/ha in the wet season. Cheaper production cost was also recorded at P8/kg in dry season and P8.6/kg in wet season. Rice Crop Manager also attained a 0.5-1.1t/ha yield advantage compared with farmers' practice.

PhilRice technologies were also promoted in Northeastern Mindanao through 8 exhibits, 5 student immersion programs, 6 national rice awareness month activities, 3 media engagements, one field day, and several walk-in visits.

Location-specific promotion modalities resulted in yield increase of at least 1t/ha in several rice areas of Agusan del Sur. PhilRice Agusan became instrumental in funding, implementation, and adoption of community-wide light trapping to reduce RBB population. The clustering approach in RiceBIS communities also improved the nutrient and pest and water management practices among farmers.

PhilRice Agusan created impacts in communities through its agroenterprise activities; establishing four rice and rice-based agroenterprises in conflict-prone areas and two Caraga.

The station also partnered with the 29th Infantry Battalion of the Philippine Army and Gawad Kalinga, state universities and colleges, senior high schools, LGUs, DA and DA line agencies, and farmer organizations

PROJECT 1:

BUILDING UNIFIED RICE NETWORK (BURN) THROUGH CAMPAIGN AND ADVOCACY

AP Tape

This project urged the *Sangguniang Bayan* of Esperanza to implement the community-wide light trapping to help farmers manage the attack of rice black bug attack in the ricefields of Esperanza, Agusan del Sur. This call was urgently responded by the local policymakers of Esperanza with 50 sets of light traps strategically installed in the area.

Advocacies on rice land preservation, responsible rice consumption; and promoting Agriculture as a promising career

AP Tape, EM Gaquit, and RR Narisma

This study called for officials in Esperanza, Agusan del Sur to issue a policy that will minimize the infestation of Rice Black Bug (RBB). Although RBB attack is extensive, damage report were not submitted and farmers were also not assisted to mitigate the problem. This study conveyed sound policy to help resolve the problem.

As result, the community-wide activities, implemented through policy, did not only facilitate easy collection of RBB, but it also promoted unity among the farmers in Esperanza. As the activities discouraged use of harmful chemicals, good health was also promoted.

Lobbying for agri-policies in strategic rice location in Northeastern Mindanao

AP Tape, EM Gaquit, RR Narisma

The call for a community-wide light trapping was responded by the *Sangguniang Bayan* of Esperanza in six calendar days; funding the activity with P238,000, which is more than enough to purchase 50 sets of light traps. Memorandum of Understanding (MOU) was signed before implementation.

Data showed that each light trap could collect an average of 2-3 bags of RBB during land preparation; too high considering the absence of its primary host. Despite the information drive conducted by PhilRice Agusan, farmers were apprehensive to utilize the light traps with standing crops in the rice field. Hence, light trapping was conducted after harvesting and during land preparation.

There were 137 bags of RBB collected from May to November. During this period, RBB population was only noted in May, June, and November. With project intervention, farmers' average yield increased by 1.16t/ha, from 2.5t/ha in DS 2017 to 4.10t/ha in DS 2018. In 2018 WS, the increase in average yield was noted at 1.16 t/ha, from 3.11t/ha in 2017 to 4.27t/ha in 2018.

The increase in yield in Esperanza rice fields particularly among the RiceBIS participants influenced the policymakers of Esperanza to create a barangay ordinance for the use of light trap during recommended timing: 3 days after, during, and 3 days after full moon. The matter is still for further discussion of the municipal council.

PROJECT 2:

AREA-BASED TECHNOLOGY PROMOTION AND STRATEGIC PARTNERSHIP

EM Gaquit

This project disseminated PhilRice technologies thru on-farm technology demonstration, trainings, exhibits, briefings, and field days.

In 2018, eight agri-trade fair exhibits and information drive were conducted across the area of responsibility. Two of the exhibits were initiated and coordinated with PhilRice Agusan's partners while six exhibits were invitation-based.

Promotion of technologies was also conducted in partnership with Agricultural Training Institute (ATI-13 and 11), National Irrigation Administration (NIA), LGUs, and private organizations during season-long and week-long training programs. About 2,000 rice farmers and extension workers were trained on rice and seed production and livelihood.

Promotion of PhilRice Technologies in Area of Responsibility

EM Gaquit, AP Tape, ST Rivas, JC Magahud and GF Estoy Jr.

This study aimed to promote PhilRice technologies in Caraga, Region X, and XI.

Through exhibit, farmers and clients were not only educated with the latest rice farming technologies, but were also introduced to registered seeds and PhilRice knowledge products. Among the technologies promoted and demonstrated were Minus-One Element Technique (MOET), Leaf Color Chart (LCC), Alternate Wetting and Drying (AWD), light trapping, rice hull carbonizer, rice hull stove, modified *dapog*, and *metarhizium anisopliae*.

Field visits, training, and engagement were also conducted to capacitate rice stakeholders. Approximately 1,000 participants including those during station's field day were educated on rice production, mechanical transplanter, and rice combine harvester. Training on mushroom production, organic farming, and rice-based farming were also presented as additional income source of the farmers.

As the identified rice expert in the region, PhilRice was regularly invited as resource person during training and briefings. Around 1,000 farmers, students and extension workers were made aware of and learned management of rice pests and diseases, nutrient, water, and PhilRice products and services.

Promotion of RICEponsible consumption and health benefits of eating brown rice and alternative crops were intensified during Nutrition Month and National Rice Awareness Month.

The study also established partnership with senior and national high schools: Agusan National High School, La Union Senior High School, La Union National High School, Agay National High School, and Balangbalang Senior National High School. Students were encouraged to take up agriculture as a promising career. Around 2,000 students and staff were reached. PhilRice Agusan also distributed more than 10,000 copies of leaflets, rice technology bulletins, flyers, and other knowledge products.

KaPALAYapaan: Incubating Agro-enterprises in Conflict-Prone Rice Communities in Caraga Region

ST Rivas

A vegetable agro-enterprise was developed in the war-torn area of Kitcharao, Agusan Del Norte. Forty farmers attended the training and was able to sell P11,000 worth of vegetable products. A swine fattening project is underway and farmers were also trained on financial management particularly financial literary. The study strengthened collaboration with non-traditional partners, such as the Philippine Army.

PROJECT 3:

PALAYAMANAN PLUS: HIGHLY INTENSIFIED, DIVERSIFIED, AND INTEGRATED RICE BASED FARMING SYSTEM

BM Tabudlong

The *Palayamanan* Plus is a large-scale intensified rice-based production system that aims to increase income and profit in the rice environments through farm mechanization, purposive integration, and diversification. It is also a poverty and unemployment reduction strategy by spinning-off rural agribusiness to create employment and income-generating opportunities in the rice farming communities.

Mushroom Production

BM Tabudlong

Mushroom production was established in San Isidro, Kitcharao, Agusan Del Norte from January to December 2018. The farmer beneficiary produced fruiting bags and harvested fresh mushroom fruit after 25-30 days after incubation.

The mushroom production component was operationalized starting in July 2018 and harvested 37.2kg of fresh mushroom generating an income of P3,056.00 from July to October 2018. Training on mushroom production and cultivation was conducted to the members of the "*Kawsa sa Paglambo* Workers Association" farmer-beneficiaries.

Vermi Production

CS Agting

Produce of vermiculture such as cast and organic fertilizer can be used in rice and vegetable production. As such, this study established and integrated vermiculture production and ensure its sustainability as component in farming system in the selected sites in Caraga.

Cagbas Natural Farmers Association (CANAFA) in Bayugan, Agusan del Sur and Canaway Planters Workers Association (CAPWA) in Kitcharao, Agusan del Norte were identified as project partners. Series of orientation meeting and briefing on project implementation were conducted.

As of November 2018, construction of vermi house in CANAFA was 75% accomplished while materials for CAPWA were delivered. Shed construction and vermiculture's initial processes will be done by yearend.

Varietal Demonstration

HA Yonson Jr., DB Bastasa, and RR Narisma

The crop enterprise component of the *Palayamanan* Plus in PhilRice Agusan included the use of locally-adapted rice varieties for highly-vulnerable rice areas. The project demonstrated that new high-yielding and resilient rice varieties can substantially improve the yields and income of rice farmers when given proper management. Vegetable integration, on the other hand, is a promising venture because it offers good profit. The ultimate goal of this project is to empower farmers to sustain the benefits from the *Palayamanan* Plus.

PROJECT 4:

RICE BUSINESS INNOVATIONS SYSTEMS (RICEBIS) COMMUNITY – AGUSAN

GF Estoy Jr.

(Reflected under the RiceBIS program)

RESEARCH PROJECTS AND STUDIES

CREATE-RICE: MANAGING CLIMATE-RELATED STRESSES FOR A RESILIENT RICE PRODUCTION SYSTEM

DB Bastasa, JC Magahud, AE Lincuna, Jr., and SLP Dalumpines

Rice yield in Caraga remains one of the lowest in the country with an average of less than 4t/ha across seasons. This can be partly attributed to high rainfall, low solar radiation, and other climate-related stresses. Study 1 under this project addressed this problem thru varietal improvement using shuttle breeding approach to develop or select locally- adapted, high-yielding, and resilient rice varieties.

Study 2 explored the potential of aquatic macrophytes as health indicator of paddy soil-water system. The study assessed the responses of *Lemna sp.* to varying chemical amendments, and determined a suitable medium for establishing and maintaining *Lemna* culture for toxicological tests.

Shuttle Rice Breeding Approach to Develop Better Location-Specific Rice Varieties for Caraga Region

DB Bastasa

The study aimed to select promising rice lines adapted in Caraga using shuttle breeding approach. Activities focused on selection of promising rice lines, germplasm collection and characterization, and maintenance breeding. Five promising rice lines with yields of 5t/ha and above were selected: C9670-B-9-2-2-2-1, C9656-B-11-1-2-2-1, PR39500-8-5-54, PR 43658-B-7-1, and IR16A1122. These can be used as parents for future crossing work or released directly as location-specific variety. There were 350

new rice germplasm materials collected, which were characterized for traits such as yield potential, maturity, plant height, and reaction to pests and diseases. Useful transgressive segregants from segregating populations were identified. Using the Rapid Generation Advance (RGA) method, these populations will be continuously planted (using one seed per plant) in controlled stress-induced condition in the screenhouse to increase the generation turnover per year. Selection will be intentionally delayed until the rice lines are fixed in the sixth generation.

Potential of aquatic macrophytes as health indicator of paddy soil-water system

JC Magahud, AE Lincuna, Jr., and SLP Dalumpines

The study aimed to assess the responses of *Lemna sp.* to varying chemical amendments; and to determine a suitable medium for establishing and maintaining *Lemna* culture for toxicological tests. The International Standard Organization (2005) developed a procedure for evaluating water quality based on the toxic effect of water constituents and waste water on duckweed (*Lemna minor*). However, such procedure should be simplified for it to be more appreciated and adopted by Filipino researchers, students, and farmers. One of the ways to simplify the procedure is to use locally-available chemical amendments as medium for culture of *Lemna sp.*

Experimental cultures were started by inoculating a healthy *Lemna* colony consisting of four fronds into petri dish containing 50ml hydroponics solution. *Lemna* colony was grown under continuous white fluorescent light. Petri dishes were positioned on similar distance from the light. Temperature in the setup ranged 29.5-31.5^{0}C, and relative humidity ranged 70- 74%. Four chemical treatments were tested: 1) 10% hydroponics solution; 2) 10% hydroponics + sucrose solution; 3) 20% hydroponics solution; and 4) 20% hydroponics + sucrose solution. Each treatment was replicated thrice. Number of *Lemna* fronds were counted, and growth rates and doubling time were calculated daily until 17 days after treatment application. Results showed that growth rate was highest in 10% hydroponics solution, at 2.5-9.9 fronds/day, from 1 until 17 days after incubation. Doubling time was also shortest in 10% hydroponics solution at 0.202-0.822 day from 1 until 17 days after incubation. Growth rates and doubling time of all treatments satisfied the requirements for *Lemna* culture to be used as experimental plants for toxicological tests (ISO, 2005). The requirements are growth rate of >0.275 fronds/day and doubling time of <2.5 days. As such, the experimental setup, with 10% hydroponics solution as nutrient medium, is recommended for establishing and maintaining Lemna culture for toxicological tests.

FABRICATION OF A LOW-COST EGG INCUBATOR

RR Narisma and GF Estoy Jr.

In January-June 2018 (dry season), the production of Pateros duck eggs and Pekin ducks were increasing and majority of the ducks were approaching maturity. Young ducks are needed to maintain egg production. However, farmers are unable to supply the required heads because of high demand from balut business owners. They procure incubated/developed eggs (16 days) from the duck farmers, which results in low production of ducklings and its availability in the locality. Commercial hi-tech artificial egg incubators are available in the market; however, these are expensive, which farmers cannot afford to buy. As such, PhilRice Agusan fabricated a prototype low-cost egg incubator for the station to sustain new batches of ducklings and to provide a cheap alternative to the farmers.

The low-cost egg incubator is 4-layered with 320 egg-capacity per operation. Based on tests, unit had 70-73% range of hatchability. One factor that contributed to its low hatchability was the fluctuation of temperature inside the incubator, in which the desired heat (37.5°C) was not attained permanently. The fabricated low-cost egg incubator was modified to obtain the desired 80% hatchability and attain the ideal temperature (37.5°C). From 320 egg-capacity, it was reduced to 240 egg-capacity per loading and heat insulator foam was installed inside the incubator to maintain the recommended temperature. This significantly increased its performance up to 78-81.25% hatchability. This egg incubator has no Thermostat, instead mini blower fan was installed. Thermometer is attached inside the unit and it is purely manually operated (egg rotation and opening holes for ventilation).

Proposed 2 types of incubators (Styrofoam & plastic incubator) were terminated because styrofoam and plastic can be easily melted if the incandescent bulb is accidentally touched. The casing (styrofoam or plastic) are also easily wrecked if not handled carefully.

A new single-layered prototype of low-cost egg incubator was fabricated with capacity of 60 eggs per load and two incandescent bulbs attached. No thermostat is installed. Based on results, this single-layered low-cost egg incubator is better than the previous prototype because its percentage hatchability reached up to 80-82%. Costing P5,000-P7,000 per unit, it is movable and is easy to load. No thermostat and blower fan were installed.

IINNOVATIONS FOR ENHANCING AND SUSTAINING RICE PRODUCTIVITY, PROFITABILITY, AND EFFICIENCY IN IRRIGATED SYSTEM

Development of Direct Seeding Technology for Irrigated Rice in Caraga

CS Agting, JC Magahud, and GF Estoy Jr.

The study aimed to reduce production cost by developing specific crop management technique for direct-seeded rice under Caraga condition. Rice production cost in this region is expensive at P39,998/ha (PSA, 2017). Labor cost particularly on pulling and transplanting of seedlings contributes significantly to the expenses. Labor shortage during the peak season also leads to high production cost. These issues could be addressed by direct seeding technology either drum seeding or broadcasting. Generally, farmers in the region are hesitant to adapt the technology due to low yielding performance of direct-seeded rice, but it could also be attributed to poor and uneven establishment and inadequate weed control. Thus, this study tested suitability of direct seeding under Caraga climatic condition through appropriate seeding rate and crop management options. It was conducted at PhilRice Agusan from January to June 2018 very wet season (VWS) and July to December 2018 (WS). Drum seeding and broadcasting was used. Three seeding rates (SR): 60, 40, and 20kg/ha were used and laid out into Split Plot in Randomize Complete Block Design (RCBD) design replicated four times. Results showed that grain yield of drum-seeded rice was significantly higher than broadcasting. Highest yield of 3.55t/ha was recorded in plots with lowest SR at 20 kg/ha, and lowest production cost at P 19,038.00/ha, and highest return on investment (ROI) ratio of P2.60. However, the highest income of P50,187/ha and also the lowest production cost of P18, 738 was gained from plots with low SR (20kg seeds/ha).

In July to December 2018, grain yield of direct seeding was also significantly highest in drum seeding. The highest yield of 4.68t/ha was achieved at 40kg/ha SR, highest net income of P74,172, and highest return on investment (ROI) ratio of P4.30. Highest grain yield recorded in both methods at 40kg/ha SR, highest total income of P91,260 and P82,680.

Optimization of nutrient use to improve yields in transplanted irrigated lowland system and climatic condition in Agusan

JC Magahud, SLP Dalumpines, and AE Lincuna Jr.

The study aimed to develop site-specific nutrient management (SSNM) recommendation to increase rice yield in irrigated areas of Agusan. Average rice yields in irrigated fields of Agusan is limited to 3.5t/ha due to soil, climate, and pest

problems. Site-specific nutrient management, on the other hand, has increased grain yields and nitrogen use efficiencies in irrigated rice areas of Southeast Asia including Philippines. As such, PhilRice is developing a nutrient management recommendation for a specific location and season under minimum pest damage in Agusan. Field experiments were conducted in PhilRice Agusan. PS Rc 18 was used as variety for the January-April cropping season and NSIC Rc 222 for the July-October cropping season. Four treatment plots were established: complete fertilizer, -nitrogen, -phosphorus, and –potassium. Each treatment was replicated five times. Fertilizer application for the complete fertilizer followed the PalayCheck system recommendation with a yield target of 5t/ha. Crop cut yields in all treatments were then determined after harvest. Results showed that –nitrogen and –potassium plots had lower yields than complete fertilizer plots for two seasons. As such, these nutrients are insufficient and should be supplied as fertilizers. Based on the results from two cropping seasons, the recommended fertilizer rates for Agusan include 60kg nitrogen/ha, 25kg P205/ha, and 30-60kg K_2O/ha. These rates should be further tested in the field to check the consistency of results on yields and on pest incidences throughout cropping seasons.

Soil and water management of continuously submerged rice soils for improved yields in Agusan

JC Magahud, SLP Dalumpines, and AE Lincuna Jr.

This study aimed to characterize the continuously-submerged rice soils in major irrigated lowland rice fields in Agusan; formulate fertilizer and water management recommendation to improve yields of continuously-submerged rice soil; and assess the growth, development, and yield of rice varieties with high yield potential under optimum water and fertilizer management in Agusan. The continuously submerged rice soil of Agusan was characterized. Constraints and status of such soil based on the characterization was known. Water, soil, and varietal management were then formulated from the soil constraints and status. Results showed that the Butuan soil is periodically submerged at 0-20cm from the surface and continuously submerged at >20cm from the soil surface. The soil has silty clay texture; has deficient nitrogen, potassium and zinc status; and sufficient phosphorus, sulfur and copper status. Alternate wetting and drying improved vegetative growth by 11-37% compared with the traditional practice of continuous submergence across different fertilizer and varietal management. Alternate wetting and drying + root application resulted in 8-25% more tillers than CS without root application. Water and fertilizer management recommendation based on the study results are as follows:

1. If artificial drainage can be constructed in the field, AWD should be employed and rice biomass should be incorporated to improve growth of lowland rice. 4 bags 14-14-14 and 0.5 bag 0-0-60 should be applied at 0-10 DAT. 46-0-0 should be applied from 14 DAT until first flowering if 6 out of 10 LCC readings, taken every 7 days, are below 4.
2. If AWD cannot be employed, seedlings should be soaked with zinc oxide solution or seedbed should be applied or sprayed with zinc sulfate.

HYBRID SEED AND HYBRID SEED PRODUCTION RESEARCH

Characterization of Areas Suitable for Hybrid Rice Seed Production

DB Bastasa and SMA Boquil

This study aimed to determine the suitability of rice areas in Caraga for hybrid rice seed production. Hybrid rice has demonstrated its high yield potential and it is gaining popularity in the Philippines. However, low supply and high cost of public hybrid rice seeds hamper its adoption. Historical data on rice yields in provinces and municipalities Caraga were gathered from DA-RFOs and PAOs. Results from hybrid rice yield trials in the station were also used. The sterility of the S line of M19 hybrid was evaluated under local temperature regimes. Results showed that Agusan del Sur is the most ideal province for hybrid rice seed production having the highest yield and largest irrigated area. Specific areas which have potential for hybrid seed production based on high yield (at least 4t/ha) and size of irrigated area (not less than 50ha) are: Jabonga, Bayugan City, Cantilan, Trento, Butuan City, Madrid, Tago, Prosperidad, Carmen, RT Romualdez, and Bunawan. Mestiso 46 and Mestiso 19 were identified suitable for seed production in Caraga. Furthermore, the S line of M19 hybrid showed partial sterility of 98% when planted in the field and 100% sterility when planted in full isolation in the screenhouse. Hence, hybrid rice seed production is possible in certain areas in Caraga at the right time of the year.

Evaluation of Rice Lines for Tolerance to Major Insects and Pest Diseases

GF Estoy Jr and NBB Paz

The study aimed to determine the reactions of promising lines to major rice diseases under field conditions, identify lines resistant to major rice diseases that can be used as potential new varieties, and characterize and compare the reactions of the different selections to white stemborer.

For January to June 2018, 181 rice lines from seven ecosystems (NCT I IL TPR, NCT I IL DWSR, MAT-DWSR, MAT, special purpose, hybrid, and heat tolerant) tested and evaluated, while for July to December 235 rice lines under different ecosystems (NCT I IL TPR, NCT I IL DWSR, MAT-DWSR, MAT, special purpose, hybrid, submergence, upland, and RLDS) were evaluated.

Results showed that for 1st cropping season, 130 rice lines reacted resistant to stemborer damage (deadhearts) and 69 lines were resistant to stemborer damage (whiteheads). Fifty-six promising rice lines were resistant to white stemborer damages and 63 promising rice lines were resistant to sheath blight and bacterial leaf blight disease. Thirteen promising rice lines showed resistance to dirty panicle. Fluctuating rice bug population was also recorded.

For the 2nd cropping (July-December 2018) all entries were found resistant to deadheart damage. Promising rice lines should first be evaluated under field conditions to ensure their resistance to major pests and diseases in the area.

Identification of Indicator Species of Plants and Arthropods as Practical Diagnostic Tools for Problematic Rice Environments

GF Estoy Jr and NBB Paz

The study aimed to identify species of plants and arthropods as diagnostic tools; determine problematic rice environments through indicator species of plants and arthropods; and determine the correlation between soil to plant and plant to arthropods in diagnosing problematic rice environment. Indicator species are plants and animals that, by their presence, abundance, or chemical composition, demonstrate some distinctive aspect of the character or quality of the environment.

Soils were collected from San Vicente, Prosperidad, Agusan Del Norte and PhilRice Agusan. Indicator species of plants and arthropods collected from Prosperidad, Agusan Del Norte were brought to the laboratory for identification. *Ludwidgia octovalvis*, *Ludwidgia perennis* (L.), and chrysomeelid beetle (*Altica sp.*) were collected. Forty kilograms of each collected soil from two sites were tested through MOET setup. The

soil from Prosperidad reacted deficient to nitrogen while the sample from PhilRice Agusan reacted deficient to Zinc.

Conservation and Management of Bio-Control Agents (BCAs) at PhilRice Agusan

GF Estoy, Jr., BM Tabudlong, MB Villaruben, NV Quiroben

The study aimed to develop management strategies to conserve and preserve biocontrol agents, and evaluate the efficacy of these conservation strategies of biocontrol agents for the control of the major rice insect pests. Preservation of different fungal biological control agents were conducted in the laboratory from January to November 2018.

Eight strains of *Beauveria bassiana* (Bb.#01, Bb.#02, Bb.SPW, Bb.#33, Bb#42, Bb.RB, Bb.Rgb and Bb.#208) and seven strains of *Metarhizium anisopliae* (Ma.#01 (Ma. SPW), Ma.#3 (Ma. Capatungan), Ma.5 (Ma.Midsayap), Ma.6 (Ma.Basilisa), Ma.116 (Ma. PhilRice), Ma.BPI Manila, and Ma.Thailand) preserved in oil form remained viable and actively grown in potato dextrose agar. Some fungal strains were passed through the insect host to maintain their virulence in the laboratory. New collection of the fungus, *Paecilomyces sp.m* - infected rice black bug was isolated and purified in the laboratory. Further, *M. anisopliae* and *B. bassiana* were also preserved in powder form using corn grits and palay grain substrates.

Pest Monitoring and Surveillance System in PhilRice Agusan

GF Estoy Jr. and AMM Rojo

The study aimed to monitor the population of insect pests of rice using fluorescent light traps installed at PhilRice Agusan farms, determine the most abundant major insect pests of rice at PhilRice Agusan farms, and determine the peak population of each major insect pests of rice at PhiRice Agusan farms. Based on the results, RBB was the most abundant major insect pest with a population of 419, 069 from January to August 2018. Peaked population of RBB was observed in May. Green leafhopper is the second most abundant major insect pests with a population of 4,098 from January to August 2018. White stemborer (WSB) population was at 3,474. Peaked population of WSB was observed in April. Brown planthopper population (2,930) peaked in March. The white backed planthopper, rice bug, and zigzag leafhopper were observed to be of least population.

Strategic Release of Fungal BCA for the Control of Major Insect Pest of Rice

AMM Rojo

This study was conducted to mass produce fungal biological control agents (BCA) for the control of major rice insect pest and to identify its best time of application BCAs were developed as alternatives to synthetic chemicals that pose human threat. These fungal BCAs included *Metarhizium anisopliae* (Metschnicoff) and *Beaveria bassiana* (Vuillemin). Mass produced *Metarhizium anisopliae* were released in the field based on treatments (every 7 days, every 14 days, every 30 days, and every 45 days). Best time to apply *Metarhizium anisopliae* was observed and determined under field setup. Data on the population of major insect pests were recorded a week after fungal application. Results showed that the best time to apply *M. anisopliae* is every 7 days and/or in every 14 days.

Mass Production, Release, and Conservation of Rice Earwig, *Euborellia stali* (Dohrn) against White Stemborer, *Scirpophaga innotata* (Walker)

AMM Rojo

This study was conducted to mass produce earwigs, *Euborellia stali* (Dohrn) for the control of white stemborer, *Scirpophaga innotata* (Walker) at PhilRice Agusan, determine the predatory efficiency of earwigs under screenhouse and field conditions, and assess earwigs' adaptability in Caraga. Twenty-three rice earwigs were collected in Esperanza, Agusan Del Sur and at PhilRice Agusan farms and were mass reared under laboratory conditions.

Efficacy of micro-nutrient supplementation in the prevention of Major Rice Diseases in Caraga

GF Estoy Jr., GA Nemeño, VF Israel, NBB Paz, JR Juma-ang, and NV Querobin

This study aimed to evaluate the effectiveness of micronutrient supplementation in preventing major rice diseases and to determine the rate of application that will prevent the occurrence of the diseases. Micronutrients even if needed in small amount are essential plant nutrients as absence of either one of these cause deficiencies that greatly affect plant growth and yield. Three fertilizer management were imposed during 2018 very wet season (January-April) and 14 fertilizer management during the wet cropping season (July-October). For the first year of implementation of the study, only zinc was used as source of micronutrients and applied in different rates, timing, and methods of application. Zinc is one of the micronutrients deficient in flooded soils, thus supplementation of this nutrient was tested at active tillering and panicle initiation stage in addition to the NPK recommended rate. Results showed that Zn fertilizer supplementation in addition to recommended NPK fertilizers did not significantly prevent the occurrence of major rice disease for both seasons. The

occurrence of major diseases such as sheath blight, bacterial leaf blight, and rice blast were recorded in all plots with or without micronutrient application. Results showed that increasing nutrient content or uptake of the plant through micronutrient supplementation particularly if the variety is susceptible to the bacterial diseases could enhance their occurrence and severity. In general, development of major rice diseases was observed higher during wet cropping season than in very wet cropping season owing to higher temperature and relative humidity. However, further studies should be done to test effectiveness and to evaluate supplementation using resistant varieties.

We are a government corporate entity (Classification E) under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos.

With a "Rice-Secure Philippines" vision, we want the Filipino rice farmers and the Philippine rice industry to be competitive through research for development in our central and seven branch stations, coordinating with a network that comprises 59 agencies strategically located nationwide.

We have the following certifications: ISO 9001:2008 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

PhilRice Central Experiment Station; Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Tel: (44) 456-0277 • Direct line/Telefax: (44) 456-0354

BRANCH STATIONS:

PhilRice Batac, MMSU Campus, Batac City, 2906 Ilocos Norte
Telefax: (77) 772- 0654; 670-1867; Tel: 677-1508; Email: batac.station@philrice.gov.ph
PhilRice Isabela, Malasin, San Mateo, 3318 Isabela
Mobile: 0908-875-7955; 0927-437-7769; Email: isabela.station@philrice.gov.ph
PhilRice Los Baños, UPLB Campus, Los Baños, 4030 Laguna
Tel: (49) 536-8620; 501-1917; Mobile: 0920-911-1420; Email: losbanos.station@philrice.gov.ph
PhilRice Bicol, Batang, Ligao City, 4504 Albay
Tel: (52) 284-4859 to 60; Mobile: 0918-946-7439 ; Email: bicol.station@philrice.gov.ph
PhilRice Negros, Cansilayan, Murcia, 6129 Negros Occidental
Mobile: 0949-194-2307; 0927-462-4026; Email: negros.station@philrice.gov.ph
PhilRice Agusan, Basilisa, RTRomualdez, 8611 Agusan del Norte
Telefax: (85) 343-0768; Tel: 343-0534; 343-0778; Email: agusan.station@philrice.gov.ph
PhilRice Midsayap, Bual Norte, Midsayap, 9410 North Cotabato
Tel: (64) 229-8178; 229-7241 to 43; Email: midsayap.station@philrice.gov.ph

PhilRice Field Office, CMU Campus, Maramag, 8714 Bukidnon
Mobile: 0916-367-6086; 0909-822-9813
PhilRice Liaison Office, 3rd Floor, ATI Bldg, Elliptical Road, Diliman, Quezon City
Tel: (02) 920-5129

SATELLITE STATIONS:

Mindoro Satellite Station, Alacaak, Sta. Cruz, 5105 Occidental Mindoro
Mobile: 0917-714-9366; 0948-655-7778
Samar Satellite Station, UEP Campus, Catarman, 6400 Northern Samar
Mobile: 0948-754-5994; 0929-188-5438
Zamboanga Satellite Station, WMSU Campus, San Ramon, 7000 Zamboanga City
Mobile: 0975-526-0306; 0910-645-9323

www.philrice.gov.ph
www.pinoyrice.com
(0917) 111-7423
rice.matters
prri.mail@philrice.gov.ph

DEPARTMENT OF AGRICULTURE
PHILRICE
PHILIPPINE RICE RESEARCH INSTITUTE
Quality Rice. Quality Life.

AJA REGISTRARS
UKAS MANAGEMENT SYSTEMS
0059